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BIOGEOCHEMISTRY OVER THE SULFIDIC/AURIFEROUS ZONE NEAR AJJANAHALLI, CHITRADURGA SCHIST BELT, DHARWAR CRATON, SOUTHERN INDIA

B.C.Prabhakar*, B.N. Rashmi and R.V.Gireesh
Department of Geology, Bangalore University, Bangalore
** E-mail: bcprabhakar@rediffmail.com*

Abstract

The sulfidic/auriferous ridge near Ajjanahalli in Chitradurga schist belt is chiefly constituted by BIF and flanked on either side by a closely knit assembly of phyllitic schists and carbonaceous shales. The mineralization is confined to the shear zone and the ore minerals are disseminated in the fracture filling quartz/carbonate veins of epigenetic nature. Pyrite, chalcopyrite, arsenopyrite and pyrrhotite are the chief sulfide minerals within which gold is hosted. The mineralized ridge is covered by fairly thick natural vegetation including herbs, shrubs and tree species. About half meter to meter thick well drained, coarse textured silty to gravelly soil form a crust over this mineralized ridge. The area is a semi-arid tract with moderate annual rainfall of ~500mm. In the present study, this auriferous zone has been chosen for geobotanical and biogeochemical study to appraise the morphological characteristics of plant species and the metal dispersion pattern in them in relation to metal content in the ground. Soil geochemistry suggests a poor to moderate accumulation of Cu (139-627 ppm), most in the range of 250-600 ppm. Many other metals show normal dispersion. Arsenic is in high concentration ranging from 695-5470 ppm. Similarly, Se also shows anomalous content (1304-2136 ppm).

Plants show inhomogeneous accumulation of metals. Cu is in poor concentration, probably owing to its poor content in soil. Slightly alkaline nature of soil could have also hindered its dissolution and the consequent mobility. Arsenic is significantly accumulated in a *Fern* species (*Pteris vittata*) which is confined only to the mine-sections in mineralized ridge. Interestingly, a clear higher uptake pattern of Au by this *Fern* is also noticed, whereas other species do not show such comparable patterns of As and Au. Gold in soil also shows moderate concentration (40-320 ppb). Thus, *Fern* species hint at the possibility of considering it as a local indicator for gold in sulfidic zones. But, detailed sampling of this species is necessary before ascertaining its value as an index plant. Other metals like Co, Zn and Mn, though present in variable concentrations in plants, they do not reflect much significance. Se, though toxic to plants at higher concentrations, was found to be enriched in plants, aptly reflecting the sulfidic nature of the substratum.

Keywords: Ajjanahalli, Auriferous zones, Sulfides, Geobotany, Biogeochemistry.

1. Introduction

Ajjanahalli auriferous zone (Fig. 1) is one of the prominent metallogenic sites in the southern part of Chitradurga schist belt (CSB) in Western Dharwar craton. It (CSB) occupies an area of about 6000 sq. km. and is dominantly made up of metamorphosed volcano-sedimentary sequences. Topographically, the auriferous zone near Ajjanahalli constitutes an undulatory hill range at an altitude varying from 640-1010 m with a smooth expression (Fig. 2). Banded iron-formation (BIF), phyllitic schist and argillite with carbonaceous intercalations constitute the chief lithology of this auriferous zone. The area is dissected by dendritic to sub-dendritic drainage pattern and the rivulets flow from South to North. The important rivulet which gets birth in this region is 'Suvarnamukhi' (the *golden face* in vernacular) which is a tributary of river Vedavathi. The name of this rivulet, thus, is probably derived from its ability to drain gold content from this auriferous area. Ajjanahalli area and the adjacent two tracts viz. Bellara and Neralagudda through which the rivulet Suvarnamuki flows, combinedly constitute the 'Golden Triangle' (Prakash, 2000).